Drivers Determining the Future of Carbon

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Analyst

Lux Research | The Deciding Factor


Carbon

Net-zero commitments are stronger than ever

COP26: Why The UN Climate Conference Matters Like Never Before

EU details ambitious plan to meet net-zero goals

Biden signs order for government to achieve net-zero emissions by 2050

How Japan is accelerating efforts towards a carbon-neutral society

Brazil's Lula lays out plan to halt Amazon deforestation

"Brazil will once again become a global reference in sustainability," the president said.

Source: Forbes, World Economic Forum, Bruegel

EU gas imports from Russia

Close to 45% of 17 EJ of gas imports come from Russia

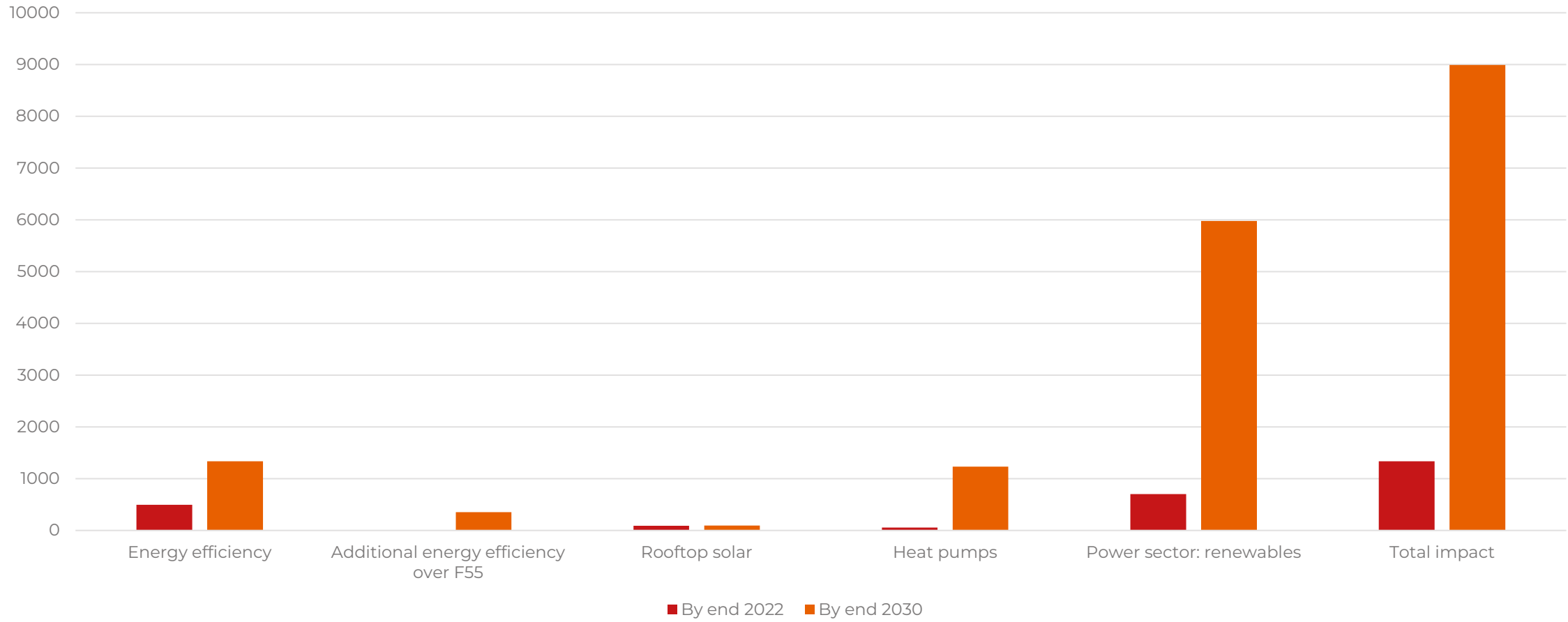
7.7 EJ

The EU, including the U.K., imported about 7.7 EJ of natural gas from Russia last year. This amount represents 45.3% of all gas imports. The runner-up is Norway, with 23.6% of all imported natural gas.

FAST-TRACK PHASE OUT OF FOSSIL RESOURCES

Energy efficiency and electrification first

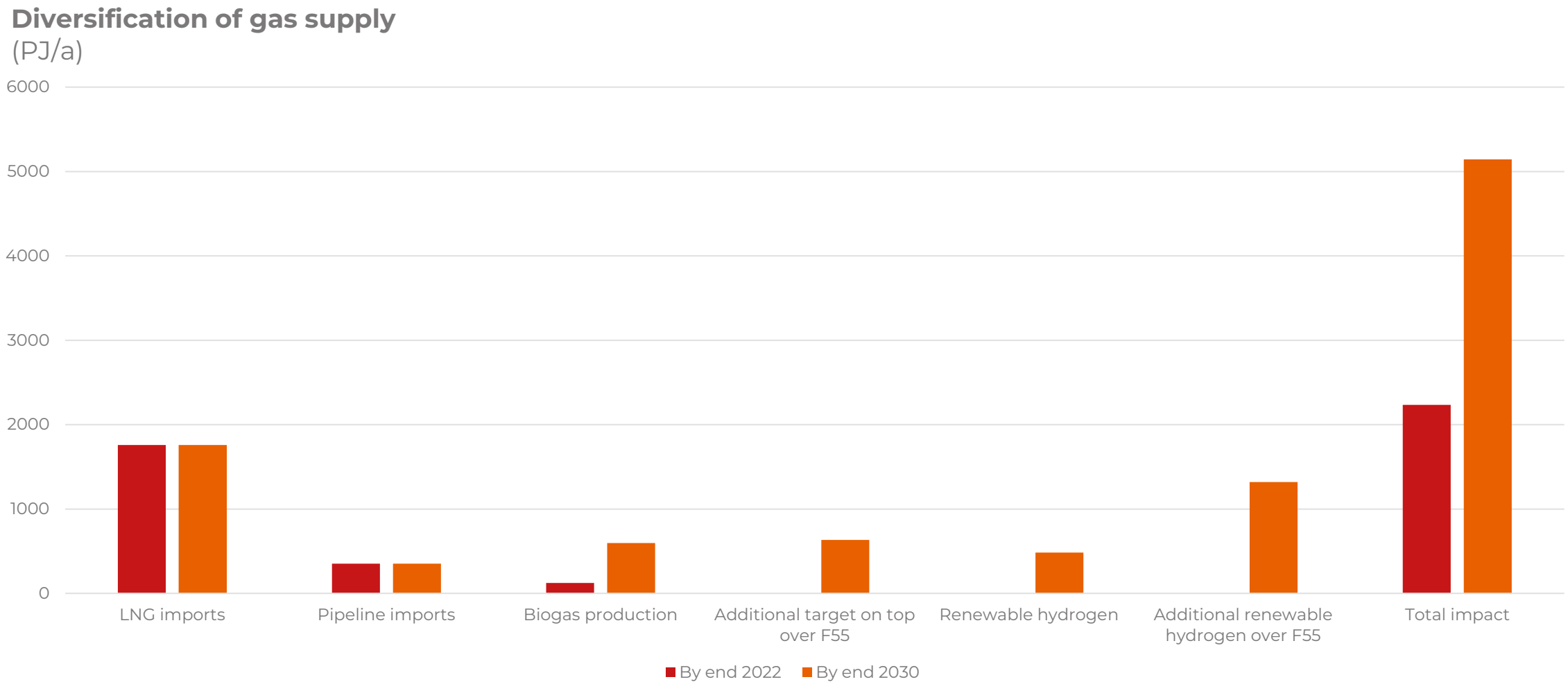
Renewable energy, energy efficiency, and electrification
(PJ/a)



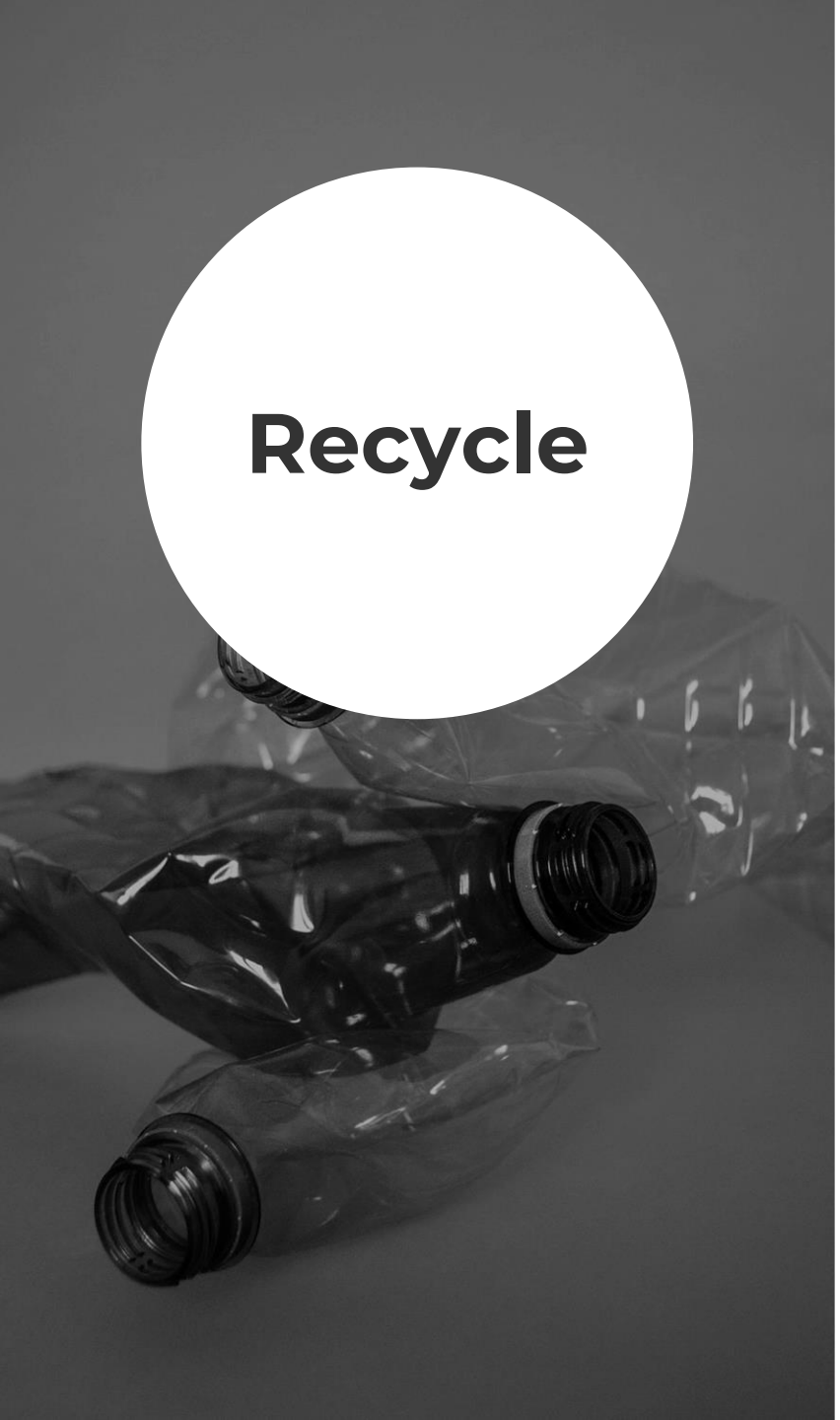
F55: short for Fit for 55, the EU program to reduce GHG emissions by 55% in 2030

FAST-TRACK PHASE OUT OF FOSSIL RESOURCES

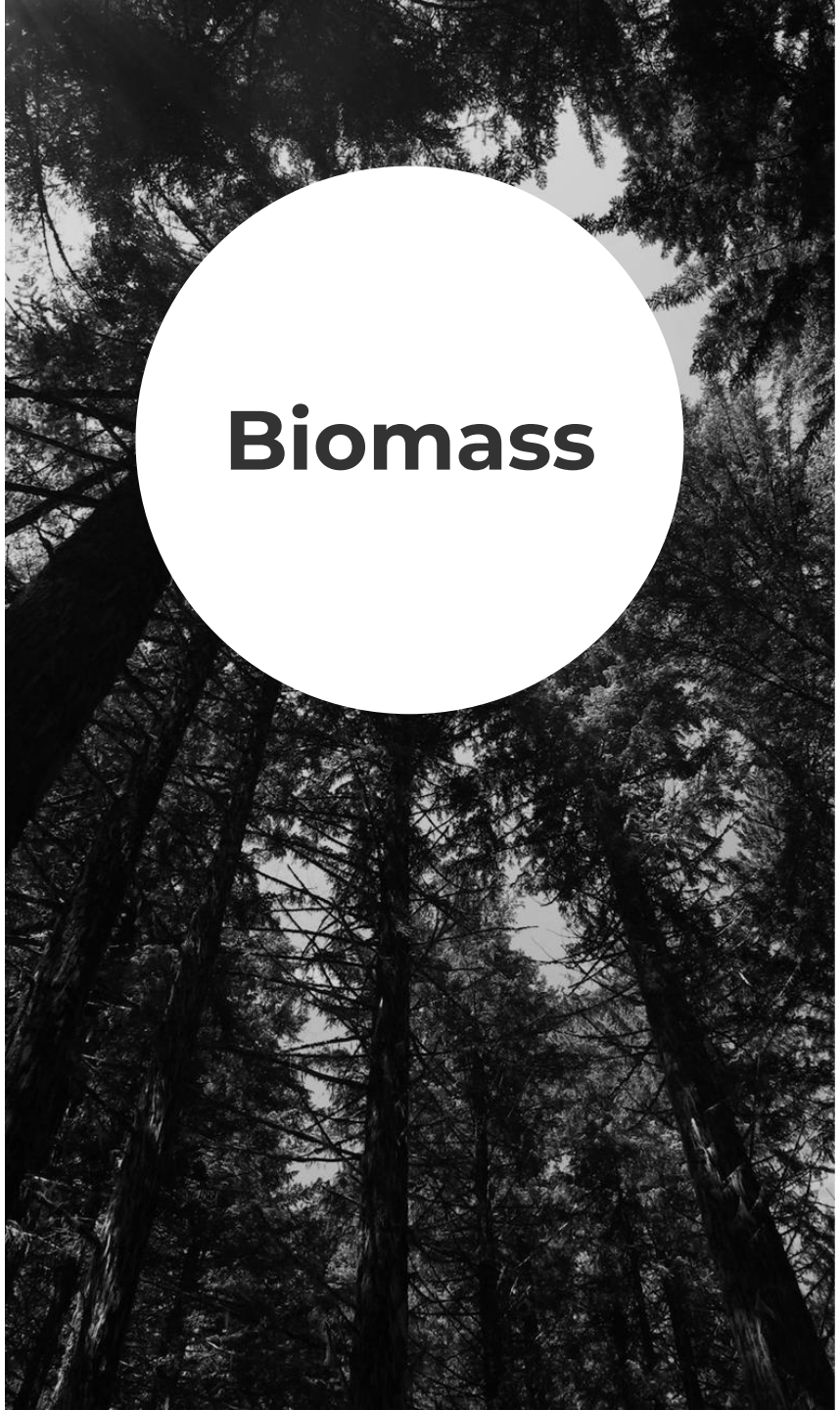
Diversify gas use



So where do we get our carbon?

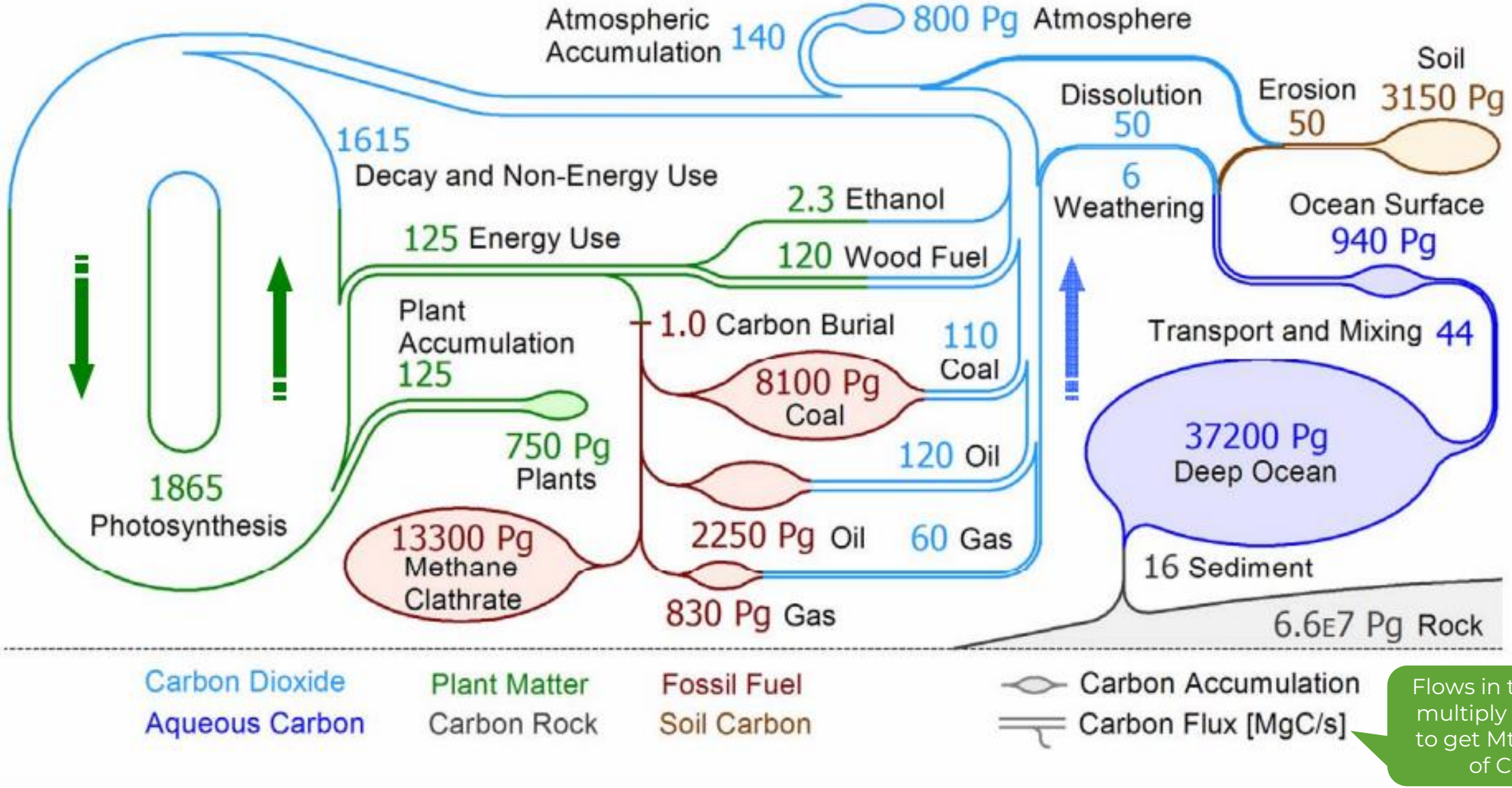


Recycle



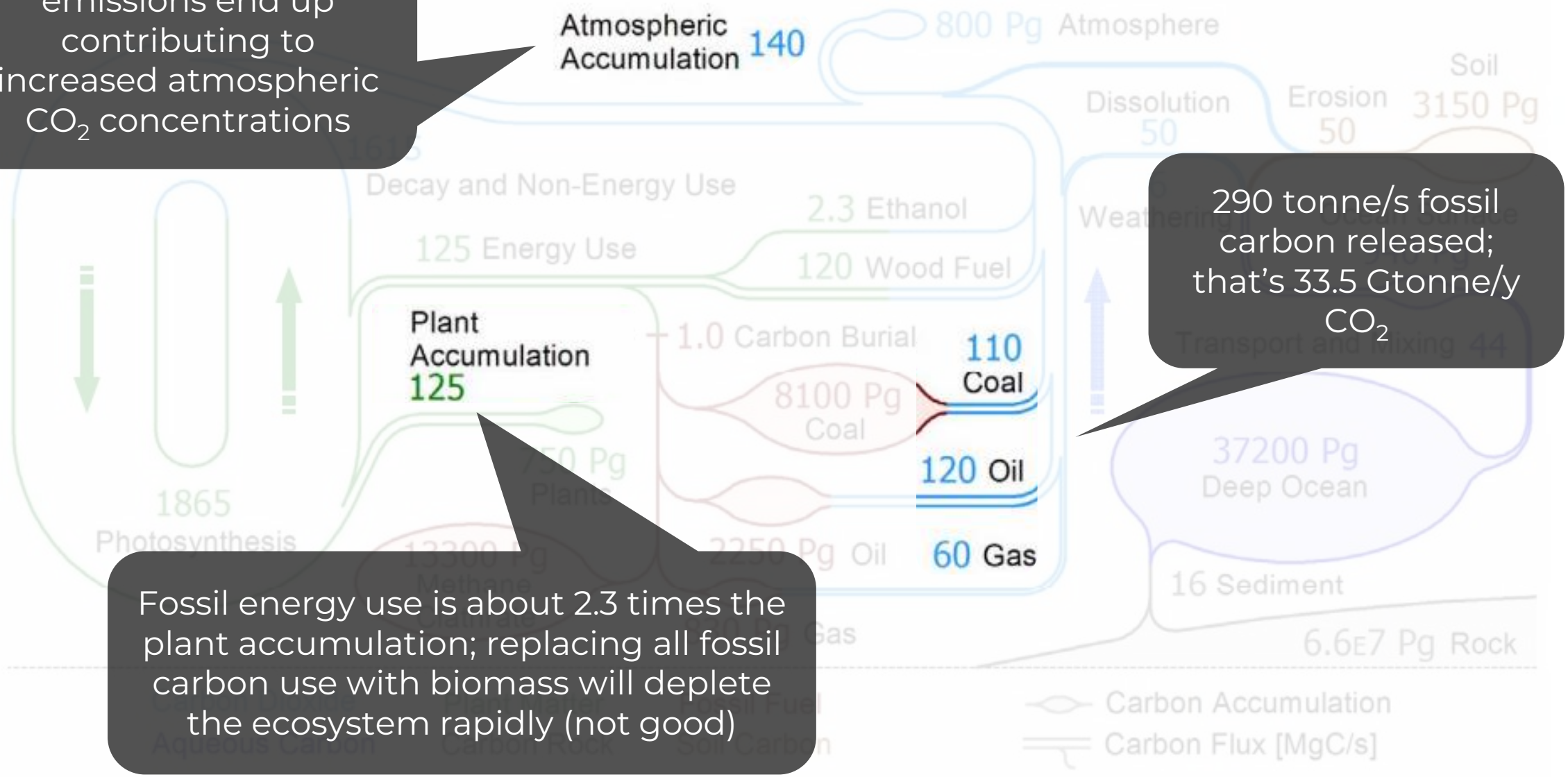
Biomass

CCUS



Source: NOAA, ESRL/GMD; W. Hermann. Quantifying Global Exergy Resources. Energy 2006;31(12):1349-1366.
SCOPE 62 The Global Carbon Cycle. C.B. Field & M. Raupach (eds.), 2004, Island Press.

Roughly half the fossil emissions end up contributing to increased atmospheric CO_2 concentrations



290 tonne/s fossil carbon released; that's 33.5 Gtonne/y CO_2

Fossil energy use is about 2.3 times the plant accumulation; replacing all fossil carbon use with biomass will deplete the ecosystem rapidly (not good)

Source: NOAA, ESRL/GMD; W. Hermann. Quantifying Global Exergy Resources. Energy 2006;31(12):1349-1366.
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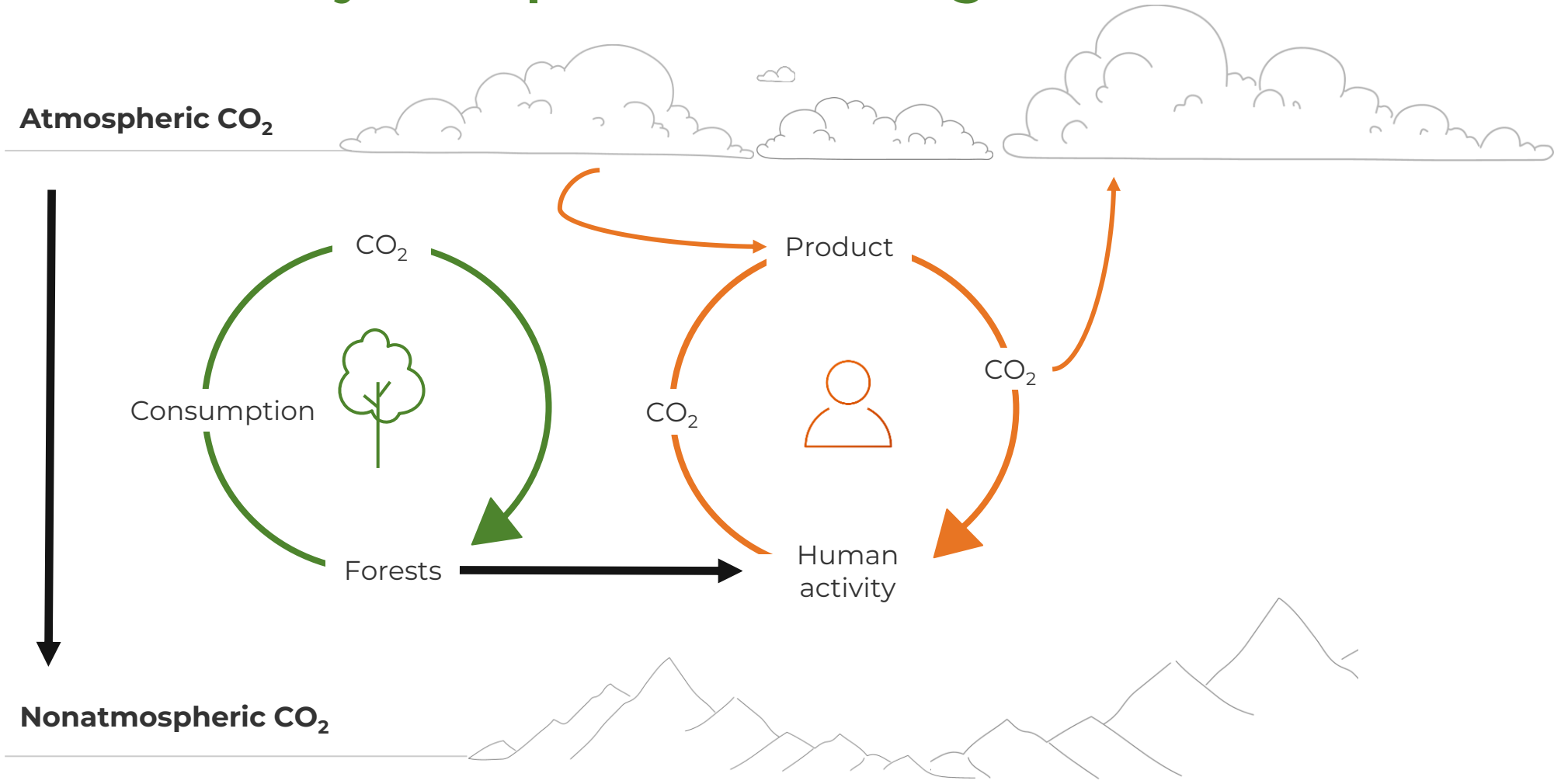
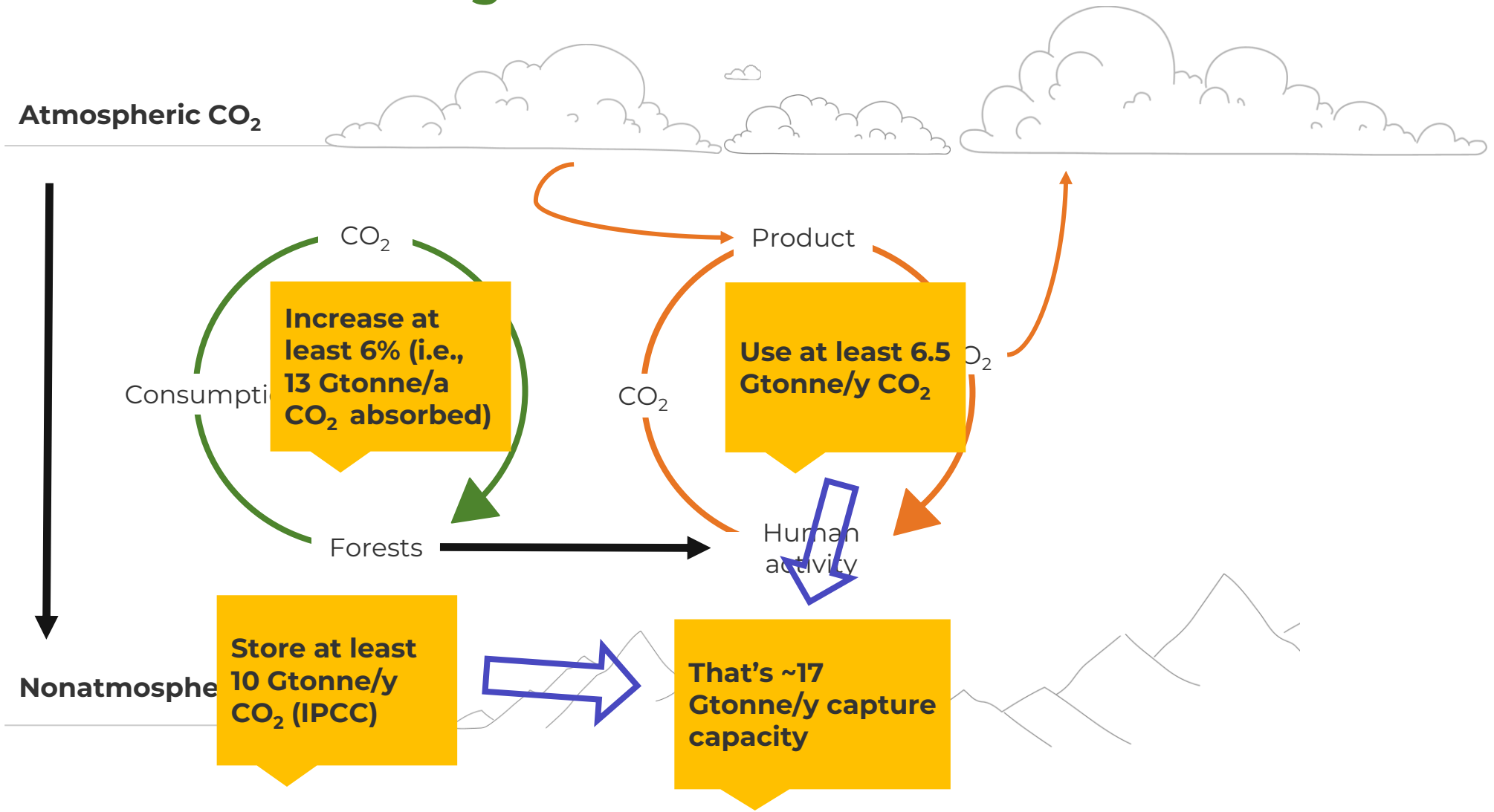
The global carbon cycle requires carbon-negative interventions



CCUS will be at least as big as biobased

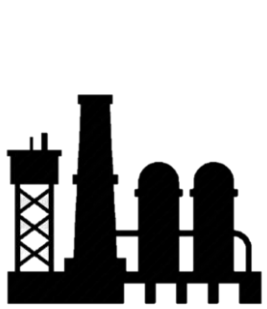


Source: Climeworks

Moving forward with CCUS

Breaking down the value chain

End-to-end overview of the CCUS value chain



CO_2 source

CO_2 Capture

CO_2 Transport

CO_2 Storage

- Subsurface storage
- Enhanced oil recovery

CO_2 Utilization

- Concrete
- Chemicals
- Fuels
- Polymers
- Carbon additives
- Proteins

Precombustion

50%–90% CO_2 conc.

Postcombustion

5%–30% CO_2 conc.

Direct Air Capture

0.04% CO_2 conc.

Collaborating corporations

- ExxonMobil is teaming up with Mitsubishi Heavy Industries (MHI) to offer a carbon capture and storage (CCS) solution.
- The two will leverage their industrial networks to tackle CCS at scale.

LUX TAKE

The two corporates provide one of the strongest offerings in the market. This announcement also marks yet another oil and gas major solidifying its CCS strategy and is an indicator for capacity emerging on the horizon.

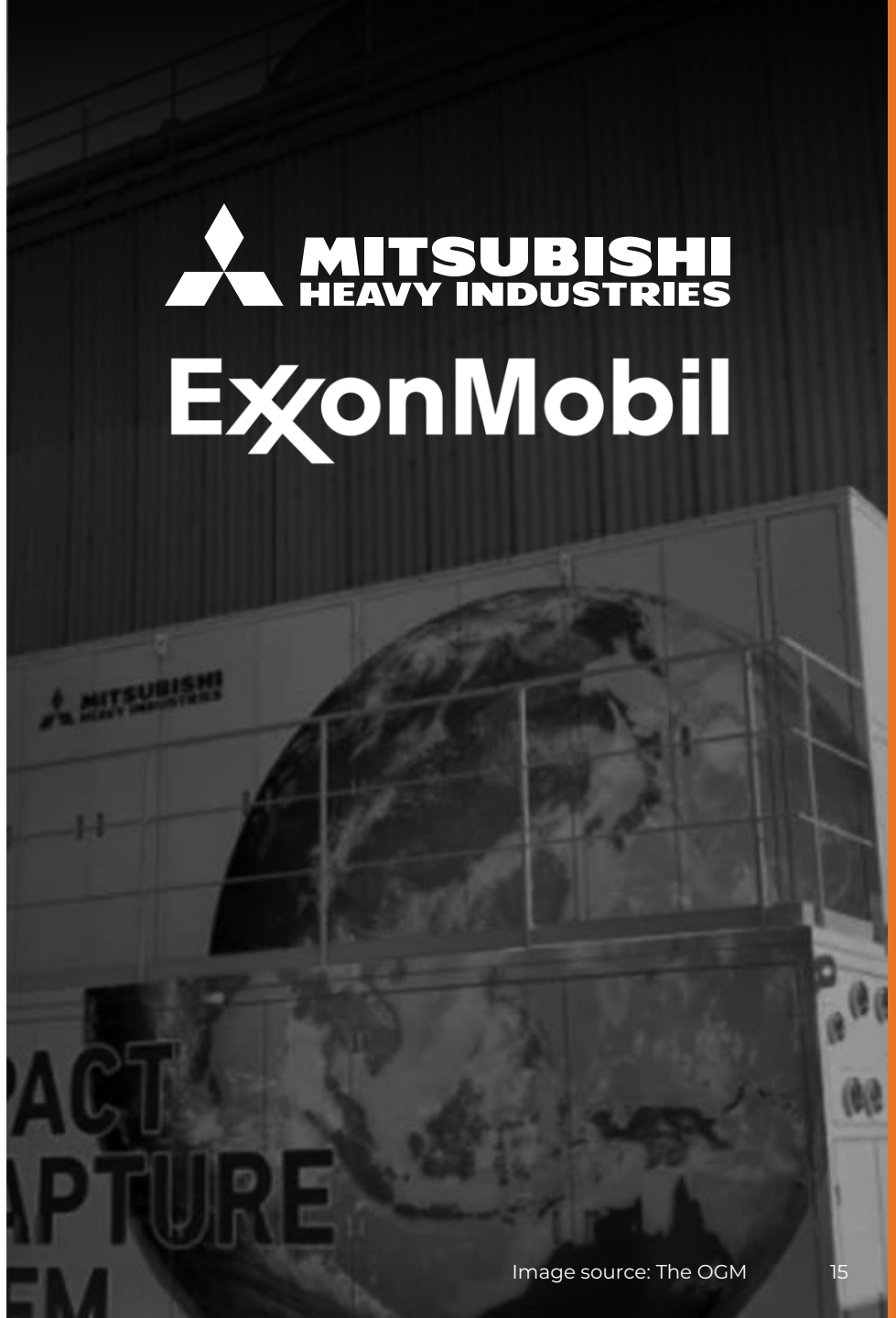


Image source: The OGM

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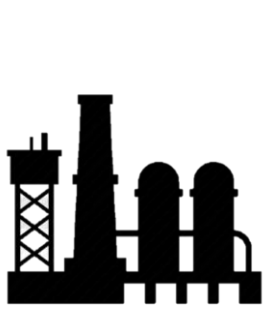

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Becoming a carbon management company

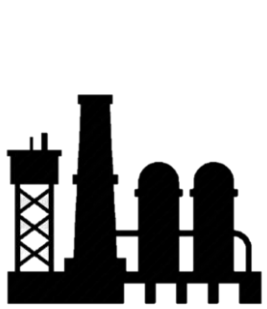
- Occidental plans to build 70 direct air capture (DAC) facilities by 2035 through its partnership with Carbon Engineering.
- Its CCUS strategy spans the entire value chain from capture to transport, utilization, and storage.

LUX TAKE

Occidental is betting that becoming an end-to-end carbon management company will address its own emissions and create a new business model handling external emissions from surrounding industry.

Image source: Carbon Engineering

End-to-end overview of the CCUS value chain



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Leading in CO_2-to-methanol

- Carbon Recycling International (CRI) began operations of its first commercial facility in China, producing 110,000 tonne of methanol.
- It plans to begin operations of a second plant in China by 2023 and third plant in Norway by 2025.
- CRI's key outcomes in China include emissions abatement, waste valorization, and value creation, even though its inputs aren't necessarily all "green."

LUX TAKE

CO_2 utilization can provide the chemicals industry with an alternative source of essential carbon feedstock. As an interim solution to accelerate commercialization, companies like CRI can concentrate on regions that appreciate overall emissions abatement.

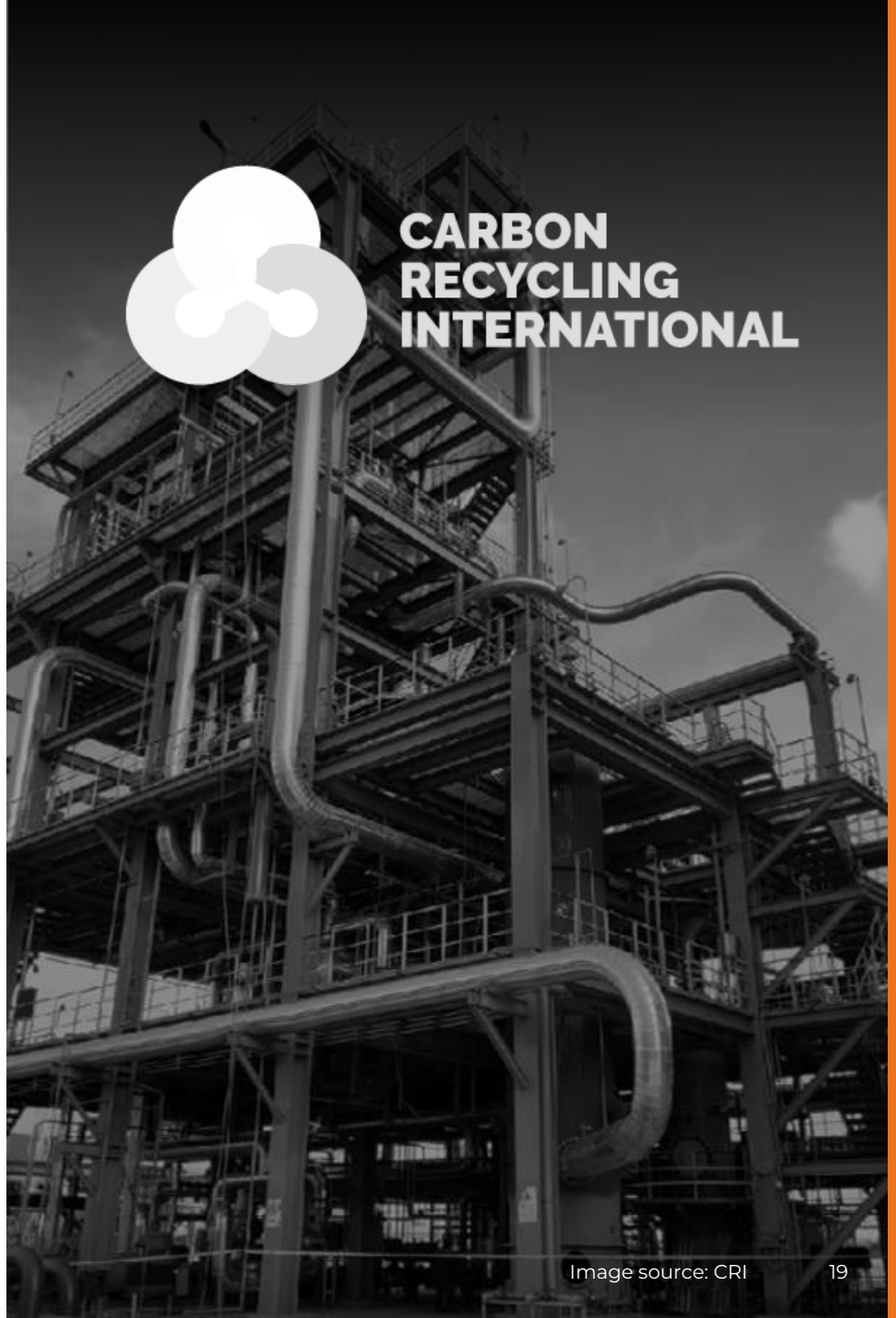


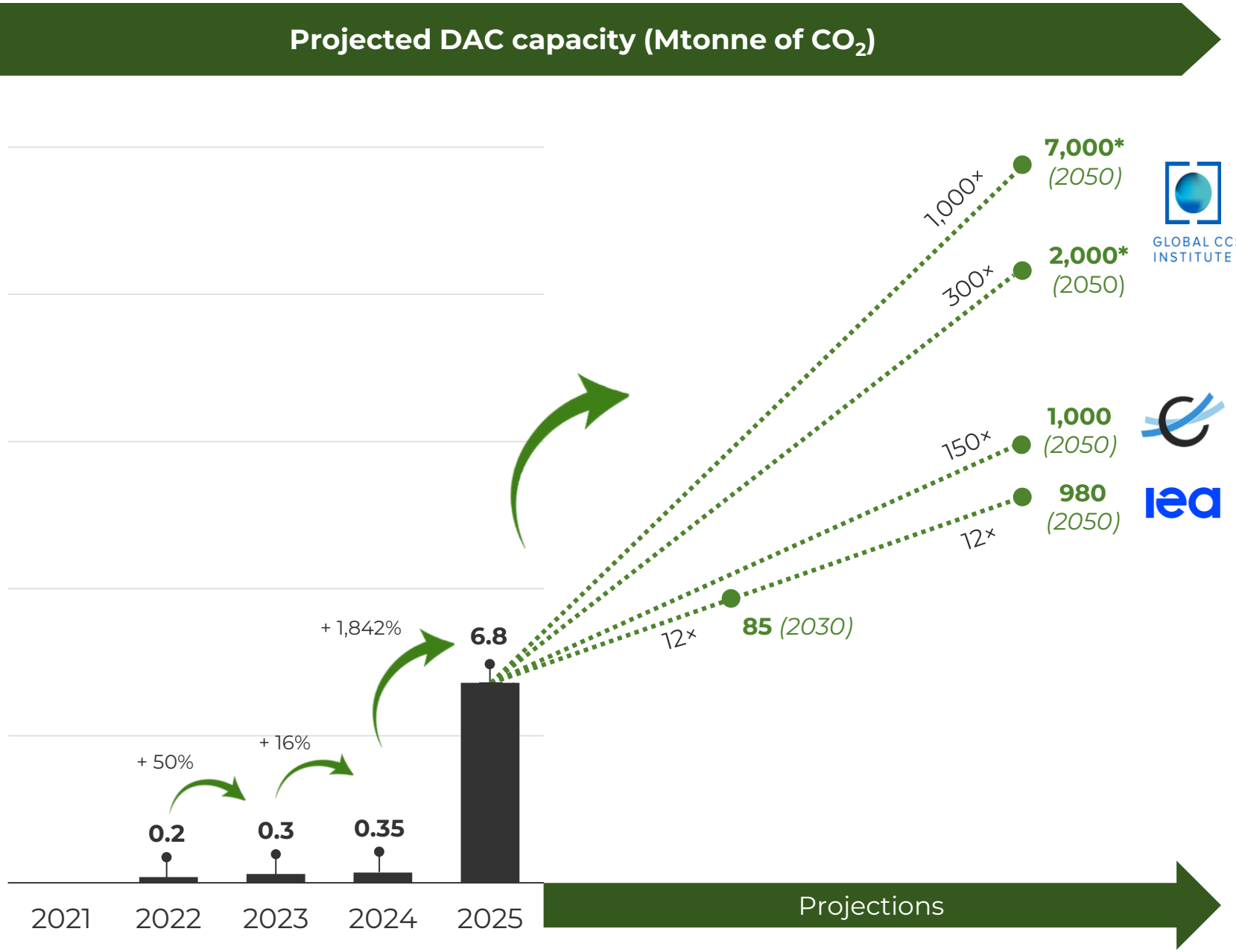
Image source: CRI

CO_2 or renewables?

Underestimating DAC

Gigatonne scale DAC is inevitable but cost sensitive

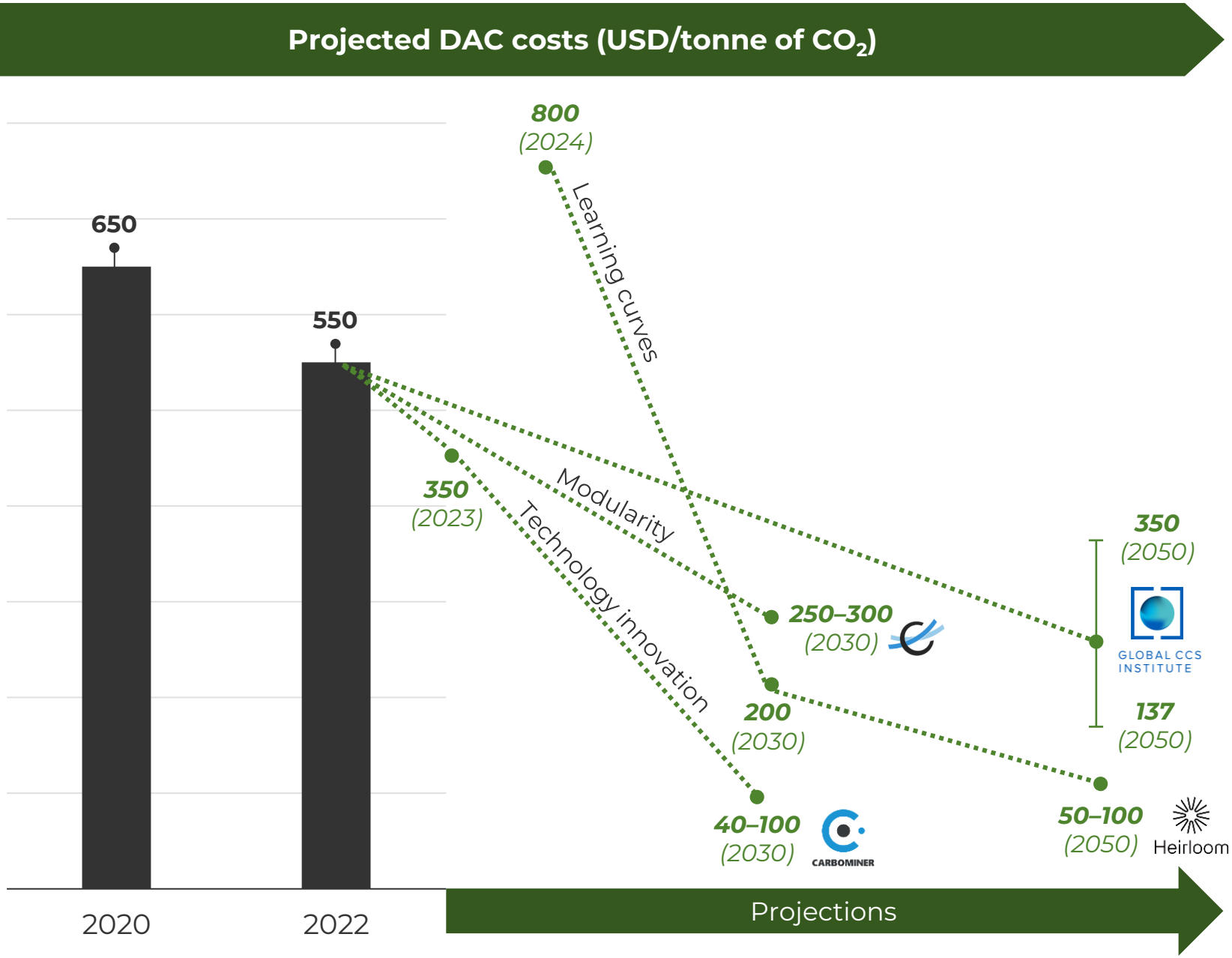
DAC capacity will scale through 2050, but the magnitude of that capacity will be heavily influenced by costs, requiring an understanding of DAC cost drivers and opportunities for cost reduction.



*The Global CCS Institute projects 7,000 Mtonne of capacity at DAC costs of USD 137/tonne and 2,000 Mtonne of capacity at DAC costs of USD 237/tonne

The decadelong promise of reaching USD 100/tonne CO_2.

With so many cost reduction pathways and claims, it becomes important to evaluate the largest cost contributors that can help realize set targets. What influences DAC costs?



Key Takeaways

1 **Emissions abatement is a balancing act of technologies**

All sources of carbon will play a role

2 **Utilization is a key decarbonization pathway**

Especially for industries inherently reliant on carbon

3 **DAC cost reduction could unlock new business models**

However, lower costs remain elusive today

Thank you

A link of the webinar recording will be emailed within 24–48 hours.

UPCOMING WEBINARS

AUGUST 8

ChatGPT: The Emerging CXO

AUGUST 10

Decarbonization of Industry: Mapping Progress on the Lux Carbon Canvas

AUGUST 15

Evaluating Technologies for CO2 Removal and Building a Robust Carbon Offset Strategy

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